

# Soundscapes of Old Centers in a Sustainable Development Perspective. Case of the "Rue de la Lyre" in Algiers and the "rue Guaspart Philippe" in Bordeaux

Dahmane Djellali<sup>1</sup>, Mohamed Chadli<sup>2</sup>, Catherine Semidor<sup>3</sup>

<sup>1</sup>PhD student at the Polytechnic School of Architecture and Urbanism (EPAU) Algiers and the laboratory GRECAU ENSAP in Bordeaux, BP 177 Route de Beaulieu, El harrach. 16200. Alger, Algérie.

<sup>2</sup>PhD of Science, Professor at the Department of Urban Planning - USTHB – Algiers  
USTHB. Faculté sciences de la terre. Département aménagement urbain. Bab Ezzouar. 16111. Alger, Algérie.

<sup>3</sup>PhD of Science, Professor at the ENSAP Bordeaux, Scientific director of GRECAU-Bx,  
740 cours de la Libération - BP 70109 - 33405 Talence, cedex, France.

<sup>1</sup>djellalidahmane@yahoo.fr, <sup>2</sup>mdchadly@yahoo.co.uk, <sup>3</sup>catherine.semidor@bordeaux.archi.fr

Received 5 January 2013; Accepted 18 May 2013; Published 7 July 2014

© 2014 Science and Engineering Publishing Company

## Abstract

Sound environments contribute to the environmental quality of urban space and it has to be stressed; the different acoustic parameters involved are in particular important for the urban sound comfort. Our research fits therefore in the general context of researches on urban sound environments and, specifically, the *interaction between soundscape and urban morphology*.

This type of approach, by the analysis of the *soundscape* in relation to the activities taking place, leads us to reflect on ways to assume the management of the sound environment in a sustainable way.

This reflection is also trying to find ways to implement sustainable management of the quality of life and provides tools to help our policy makers and planners in creating a sound ambiance of quality?

*Sound walks*, methodology developed by the GRECAU laboratory and described in numerous international publications have been conducted on both courses in order to assess the quality of their urban soundscape.

This paper will outline the *soundscapes* related to activities of a street whose heritage importance requires the preservation of what makes its quality of life.

## Keywords

*Urban Form; Soundscapes; Sound Environment; Traditional Architecture*

## Introduction

The relationship between soundscape and urban morphology is an issue that concerns policy makers, planners, architects, urban planners as well as acousticians.

The reflection on the creation of urban environments is interesting and is in line with the idea to harmonize the basic structuring elements of the city and the acoustic parameters involved in the comfort and quality of the urban soundscape.

The atmospheres, specific emergent entities of an architectural space, are studied by taking as a starting point the modalities of perception of an inhabitant (measurable, objectively from the physical description of the sound phenomena), of their representation (their qualitative expression), or from the point of view of the urban conception (design) (put to the test by the habits of construction)

For our research, the program will be defined taking into account the multi-disciplinary approach: engineering sciences, architecture and urbanism.

This challenges us to think about the tools to implement for a better living environment.

What a sound space, how does it establish and which is the perception?

The noises generated by the various urban activities, the sounds generated by the individuals or sounds produced by the nature can be the new parameters for the definition of the comfort and the living environment?

How the city decision makers can they support this dimension to construct the landscape, city or public space by a qualitative place to live?

This research fits therefore in the general context of research on urban sound environment, specifically on the *interaction between soundscape and urban morphology*.

How are these interactions?

What are the components that will enter into a soundscape?

The work is developed on the sites of the ancient centers of two cities namely Algiers and Bordeaux. In Algiers we chose on the one hand the "*rue de la Lyre*" located in the district de la Marine, ancient tissue belonging to the historic core of the Kasbah, a mixed fabric formed by two typologies leading to a strong urban design and on the other hand the low part of the same district (waterfront) of a Haussmannian typology. In Bordeaux we are interested in the "*rue Guaspard Philippe*" located in the city center, marked by new developments highlighting the architectural, environmental qualities and by the preservation of its heritage aiming an improvement of the quality of life. It is worth noting that the two old centers are UNESCO classified World Heritage sites Algiers [3] and Bordeaux [2].

## Approach Analysis Methodology and Research Techniques

### Question of Scale Reading

Grasping the phenomenon of sound at the level of the city, district or area poses different questions and requires different methods of investigation. For the analysis of urban forms we modeled the perceptual approach that tackles the problem of the morphology in terms of meaning and interpret the urban forms in terms of visual, social, historical and economic perceptions [5]. In this sense, the interpretation of figures depends on the object's properties (color, size,

shape) as a pre-knowledge of things where the understanding cannot be based on experience alone. Generally speaking, this approach shows concerns linked to the observation of the formation and transformation of urban forms [7].

For the observation of acoustic phenomena in town, choosing a scale of observation is therefore necessary. The street, area, district or building block represent different scale readings of urban forms and each of these scales of investigation requires a specific approach.

These typologies induce a diversity of urban sound phenomena whose material is closely linked to the frequentation and activity of the street, the area or district where they are identified. As a result, urban forms have an acoustic function [1], identifiable by location according to the noise communication they generate. In our case, an architectural scale will be more adequate to evaluate the urban sound ambiances. Indeed, the recognition of the soundscape of the streets in qualitative terms is mainly local.

Consequently, to characterize the ambiance of the whole area, beyond the street level, in which the observed sound phenomenon occurs, our urban examples will be at the urban scale of the *district* or *area* [7].

### Selection of Study Sites

To enable us to respond to a set of questions, the study will focus on *urban areas*, the streets, defined as fragments of the city whose soundscapes are analyzed by using the sound walk method [9]. *These areas* will be specified and detailed by the criteria of location, temporality and functions, allowing us to clarify the concept of ambiances in specific situations in the old districts.

To do this we choose their function (the activities) as a selection criterion in order to observe if they actually have distinct or similar sound identities. This choice is defined in order to have a maximum of information on the qualitative aspects of the ambiances of the studied *areas* allowing the creation of support tools to design ambiances or to choose decisions. As first site we selected the '*rue de la Lyre*' in the district de la Marine of the historic center of Algiers (Figure 1, table 1) and the '*rue Guaspard Philippe*' (figure 2, table 2) as places of equivalent activities in the city center of Bordeaux.

*Algiers: District de la Marine*

TABLE 1 TABLE OF IDENTIFICATION OF THE SOUND WALK IN THE RUE DE LA LYRE, ALGIERS.

N°	Studied area	Beginning of the route	Type of space	Building outline	Activities	Daytime	End of the route	Obs
01	Rue de la Lyre	Marché de la Lyre	U-shaped street	3 storeys	Commercial	Morning	Place Ben Badis	Open air



FIG. 1 IDENTIFICATION OF STUDY SITES / DISTRICT DE LA MARINE / ALGIERS

*Bordeaux: City center*

TABLE 2 TABLE OF IDENTIFICATION OF THE SOUND WALK IN THE RUE GUASPARD PHILIPPE, BORDEAUX

N°	Studied area	Beginning of the route	Type of space	Building outline	Activities	Daytime	End of the route	obs
01	Rue Guaspard Philippe	Marché les Capucins	U-shaped street	1 and 3 storeys	Residential and Commercial	Morning	Place Saint Michel	Open air

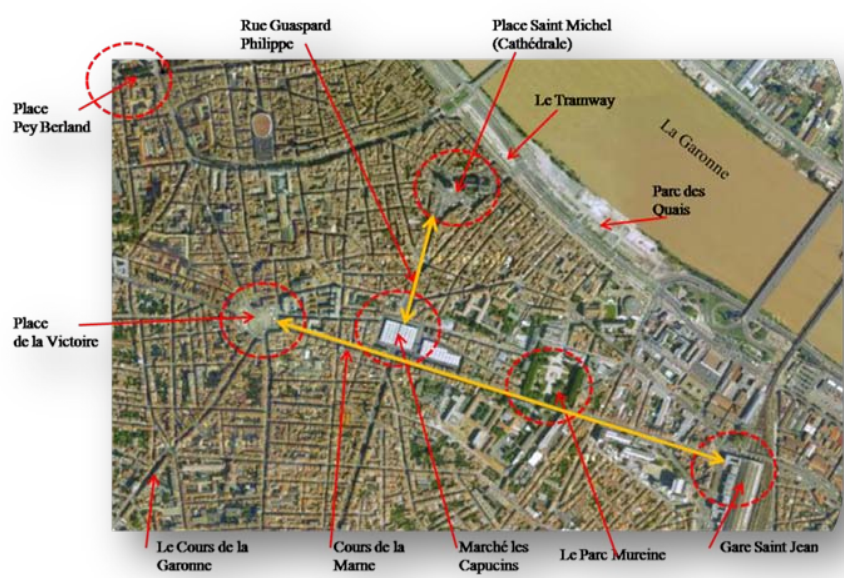


FIG. 2 IDENTIFICATION OF STUDY SITES / CITY CENTER / BORDEAUX

*Experimental Method: The Sound Walk*

The concept of soundscape was proposed by R. Murray Schafer [8], Canadian composer. To put it into

practice, we rely on the sound walk approach, a methodology developed by the GRECAU research laboratory in Bordeaux [9]. It provides a snapshot of what we can hear on an urban site in terms of activities

taking place. According the requirements of the study the course takes half an hour, complementing the standard acoustic measurements of urban noise at a point on the front of the facade. The procedure is based on the use of a binaural sound recording system associated with photographs. The photographs are used to keep track on the one hand of the urban forms in which the walk takes place and on the other hand of the type of sound sources present.



FIG. 3 RECORDING AND PROCESSING EQUIPMENT

### Equipment

For its sound equipment (Figure no. 3), the GRECAU Bordeaux has a DAT recorder and a ZOOM H4 recorder equipped with a "dummy head". This acquisition system provides access to stereo recordings similar to the natural binaural listening of the walker. This provides both signals that can be heard to have an opinion on the quality of the urban sound urban and figures presented in the form of "acoustic images" (Figure 4) comparable to the measurement results. A set of tools is used to carry out this work, composed of the SYMPHONY signal acquisition system , the

software (01dBENV32) defined for the acoustic environment (dBTRIG32 for the acquisition of data in CMG and dBTRAIT32 data files for the data processing in forms of acoustic images) [11].

### The Acoustic Images (figures 4 and 5)

Analysis and use of acoustic images are based on the principles defined in the GRECAU laboratory [9].

**Syntax:** Acoustic image / Place Ben Badis - Place des Martyres / OG-OD

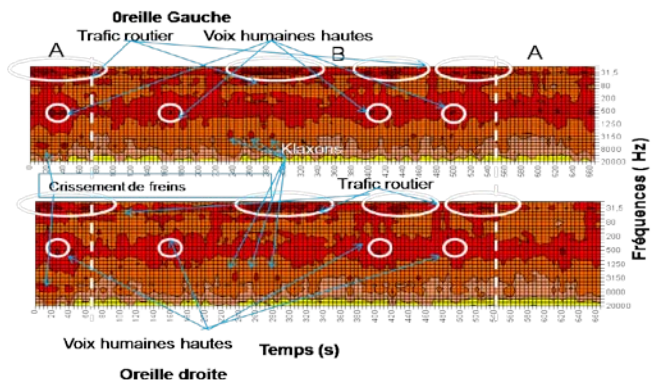


FIG. 4 ACOUSTIC IMAGE / PLACE BEN BADIS – PLACE DES MARTYRES / MORNING / OG-OD



FIG. 5 LEGEND OF THE ACOUSTIC IMAGE (COLOR CODE GRECAU LAB)

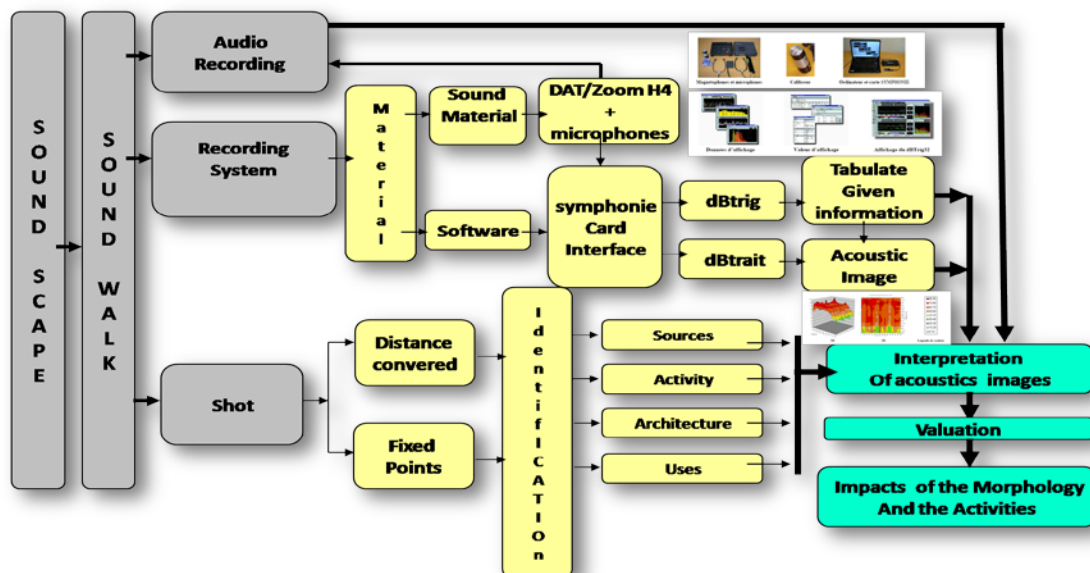


FIG. 6 CHART OF THE PROCESS AND PROCEDURE OF THE SOUND WALK

### Organizational Process and Procedure of the Sound Walk

The chart below schematizes the whole process of the walk based on the soundscape concept (Figure 6).

Characteristics of the Sound Walks of the Places

In this analysis we considered the street as structuring and organizing element of the town or city center,



linking the highlights in the city, characterized by their soundscapes.

Characteristics and Identification of the Streets

To draw conclusions on the qualitative aspects of the sound walks of the "rue de la Lyre" and those of the "rue Guasparid Philippe", the approach of the data use was based on several listening of the recordings made on both routes which allowed to give our impressions on the soundscapes of the streets and to determine the characteristic elements of the soundscape of these urban areas.

1) Characteristics of the rue de la Lyre (table 3 and figures 7-11)

This route starts at the marché de la Lyre (open fabric) near the National Theatre (TNA), passes through the middle of the rue de la Lyre (Bouzrina Street, closed fabric, U-shaped Street) and ends up

before Place Ben Badis ( Former Malakoff, open space defined by the Ketchaoua Mosque).

The walker is in the middle of the rue de la Lyre, street without sidewalks, 8 meters wide, lined on either side by a covered arched walkway, and walks in the open air along the outside of the arcades (propagation in a U-shaped street), a completely open space near the Place Ben Badis and the marché de la Lyre (free-field propagation) [1].

TABLE 3 CHARACTERISTICS OF THE ROUTE IN THE RUE DE LA LYRE, ALGIERS.

Day	Sunday 05-04-2009 - Morning - sunny.
Duration of the walk	9mn 15seconds.
Temperature	Seasonal.
Wind	None
Human presence	Important and permanent
Traffic density	Very low
Situation	District de la Marine. Algiers



FIG. 7 ROUTE RUE DE LA LYRE OUTSIDE THE ARCADES /ALGIERS.

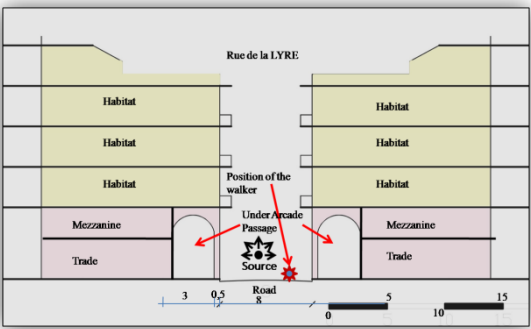


FIG. 8 POSITION OF THE WALKER IN THE RUE DE LA LYRE OUTSIDE THE ARCADES.

Sound sources and characteristics of the soundscape

The characteristics of this route are defined by different commercial activities located at the beginning of the route (near the marché de la Lyre). The proximity of the marché de la Lyre influences the ambiance of this street a lot. Because the market is

much frequented its indoor ambience reflects the social and cultural dimensions of this area. However, considering the behavior of the people when they are shopping and conversing what they usually do in groups which gives this street a human urban ambience, the noise levels inside are very acceptable (70 to 80dB) in the middle frequencies.

Analysis of the acoustic image of the rue de la Lyre  
Analysis of the sequences (figure9)

- **Sequence A:** Noisy zone. Outdoor propagation due to the proximity of the marché de la Lyre and the influence of road noise in this area. Strong influence of commercial activities with a predominance of human voices.
- **Sequence B:** Very noisy area. Predominance of road traffic noise and human voices. Commercial activities do not exist on these traffic lanes.

- **Sequence C:** More or less quiet area, dominated by the sound of human voices. Propagation in the U-shaped street, giving a similar impression of noise generated by vehicle traffic and human voices coming from covered symmetric spaces under the arcades located on either side of the route.
- **Sequence D:** Noisy area, near the Place Ben Badis (ex-Malakoff). Sound propagation in a U-shaped street with a continuation to an open space leading to a

continuity of human ambiances which are very characteristic of this place, with very different shops. These activities are largely spread over the traffic lanes. On this route the human voices (words) are predominant giving rise to a familiar ambiance. Commercial activities are very dominant, giving the site a special character, recalling the former activities of the district where the streets were specialized by type of activities (old fabric of the Kasbah).

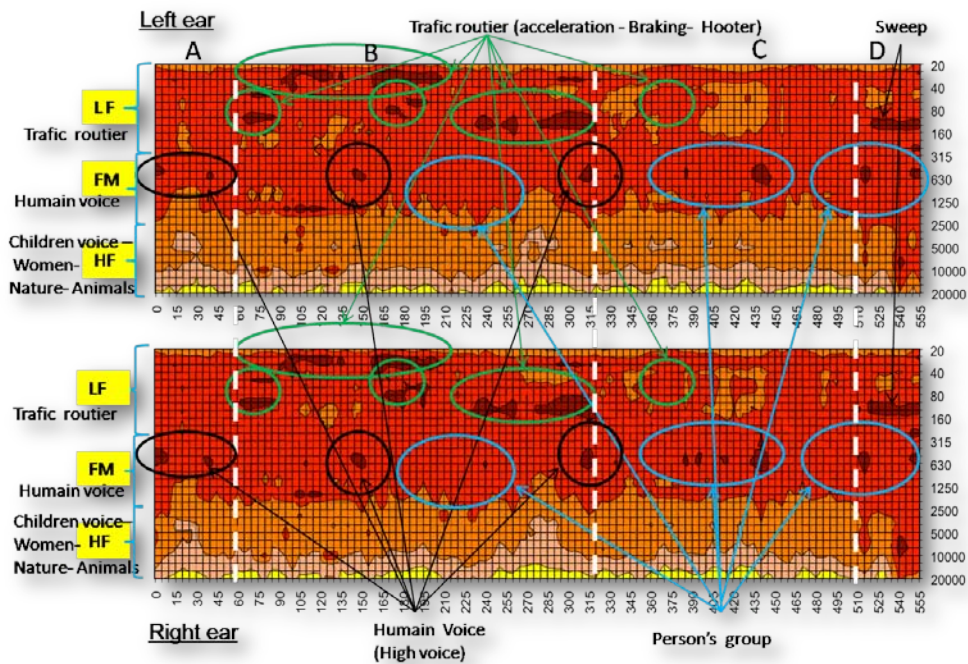


FIG. 9 ACOUSTIC IMAGE / RUE DE LA LYRE / OUTSIDE THE ARCADES / MORNING / LE-RE



FIG 10 AMBIANCES RUE DE LA LYRE OUTSIDE THE ARCADES (THE BEGINNING OF THE ROUTE)



FIG. 11 AMBIANCES OF THE RUE DE LA LYRE OUTSIDE THE ARCADES

TABLE 4 CHARACTERISTICS OF THE ROUTE IN THE RUE GUASPARD PHILIPPE IN BORDEAUX

Day	Saturday 30 -01- 2010 - Morning - sunny.
Duration of the walk	03mn 36secondes.
Temperature	Seasonal
Wind	None
Human presence	Important and permanent
Traffic density	Low
Situation	City center of Bordeaux

2) *Characteristics and Identification of the rue Guaspard Philippe (Table 4, figures 12 to 18)*

The route starts from the Place des Capucins (open fabric), passes through the side street (very open street) near the market and a part of the rue Clare with closed tissue (U-shaped street). The second part of the route starts from the roundabout (open space) runs along the rue Philippe Gaspard (U-shaped street) and ends near the marché St. Michel (open space).

The walker is in the middle of the street with wholesalers and consumer business at the end. A



part of the street is occupied by the parking of vehicles that occupy half of the street. The other half is reserved for the passage of cars in both directions.

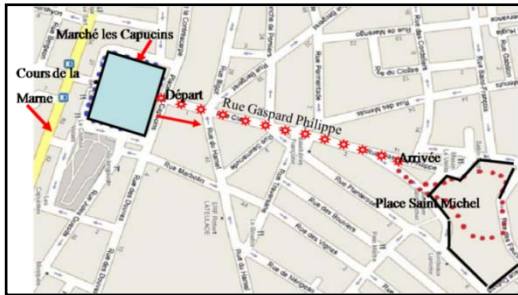


FIG. 12 ROUTE FROM THE PLACE ST. MICHEL TO THE RUE GUASPARD PHILIPPE, BORDEAUX

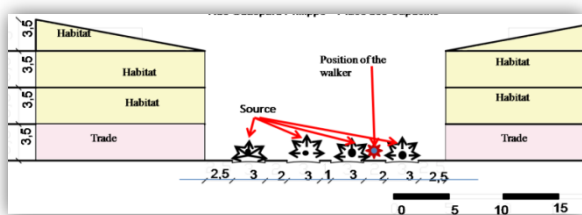


FIG. 13 POSITION OF THE WALKER IN THE RUE GUASPARD PHILIPPE NEAR THE MARCHÉ LES CAPUCINS (START OF THE ROUTE)

*Sound sources and characteristics of the soundscape* (figures 13 to 18)

The route of the rue Philippe Gaspard connects two important urban facilities in the structuring of the city of Bordeaux to know the marché des Capucins and the marché Saint Michel.

We are interested in this street, by the fact that it articulates two highlights of the city, and its

transformations due to the creation of commercial activities. This allows us to see that the effects of continuing or discontinuing noise of car horns don't or rarely exist or rarely due to the observance of traffic laws and respectful behavior towards of the environment (cultural and social dimension).

The noise levels recorded during this route are quite interesting and define the character of this quiet residential neighborhood (quiet space). The architectural typology, building's dimensions (R 1) to (3 R) and the urban morphology play an important role in the sound propagation (outdoor propagation) [1].



FIG. 14 AMBIANCE RUE GUASPARD PHILIPPE (START OF THE ROUTE)

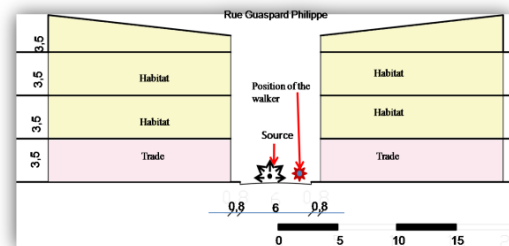


FIG. 15 POSITION OF THE WALKER IN THE RUE PHILIPPE GUASPARD (MIDDLE OF THE ROUTE)

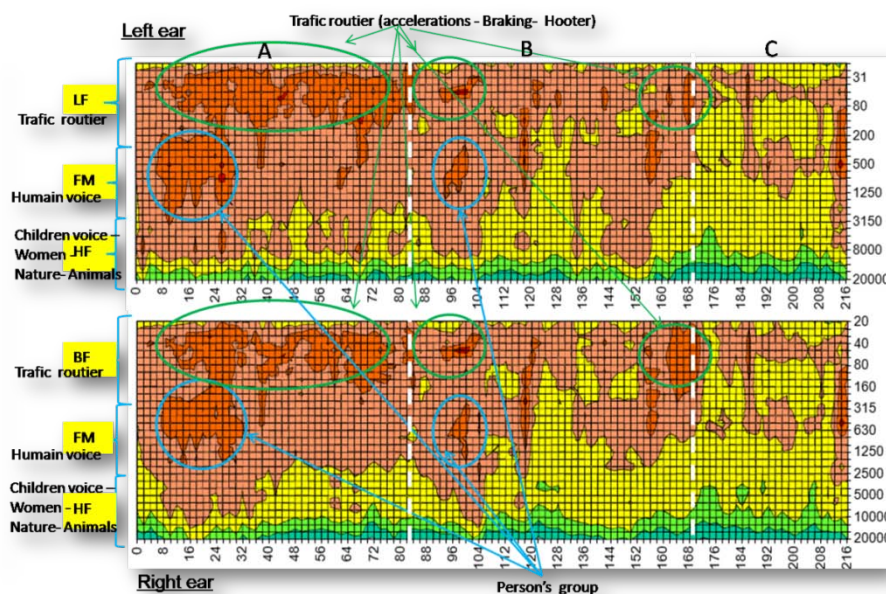


FIG. 16 ACOUSTIC IMAGE / RUE GUASPARD PHILIPPE / LE-RE



FIG. 17 AMBIANCES RUE GUASPARD PHILIPPE (IN THE BACKGROUND THE CATHEDRAL)

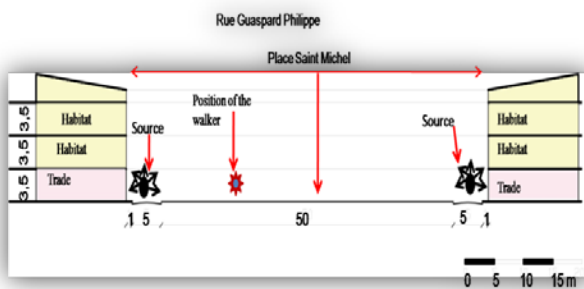


FIG. 18 POSITION OF THE WALKER THE PLACE SAINT MICHEL – RUE GUASPARD PHILIPPE (END OF THE ROUTE)

*Analysis of the acoustic image of the rue Guaspard Philippe*  
*Analysis of the sequences* (Figure 16)

- **Sequence A:** the sequence (A) represents a sequence where the walker is on the market place des Capucins, surrounded by commercial activities. The presence of road traffic noise does not affect the general atmosphere of this place (quiet space). The background noise level is approximately (50 to 60dB) which reflects the sound quality of this place. The levels recorded (50 to 60dB) and (60 to 70dB) are identical in the acoustic images of the left ear and the right ear.
- **Sequence B:** In this sequence (B) the levels recorded are well below those of sequence (A) with (40 to 50dB) and (50 to 60dB) and define exactly the sound characteristics of this very quiet street. The perception of sound is the same for both ears in the range of frequencies.
- **Sequence C:** The sequence (C) reflects the residential character of this area and we can perceive that sound sources have a very low intensity level. Equivalent noise levels recorded (40 to 50dB) in the last part of the route characterize well this quiet residential site. It is interesting that the perception of the recorded sounds is identical for both ears according the sequences and in the full range of frequencies.

## Discussion

The comparative analysis of sound walks made in the *lieux* defined by the streets obtained results that connect the different urban and architectural morphologies considering the commercial activities that take place, the flow of vehicles and their sound environment.

Indeed, the results obtained from acoustic images of the two routes show that the noise of the sound sources is of human origin. Taking into account the particularities of each studied area we identified several parameters that have greatly impacted the equivalent sound level. These are in particular the *situation*, the *area*, the *design* and the *integration* with respect to the immediate environment.

The daily and weekly activities as defined by the sound sources can be classified according the classification of A. Léobon [6].

- 1-Urban Activity, 2-Human presence,
- 3-Human Activity, 4-Animals Sounds.

Difficulties encountered:

The scale of the acoustic level proceeding by ranges of levels, involves difficulties in the analysis of the acoustic images. Indeed, the representation of a sound hardly louder than another, but just to get in 'the category of the above' would be reduced by a 'color jump' on the acoustic image and thus the interpretation would largely distorted.

Difficulties specifying by physical indicators common to all the situations what are of the order of the sensitive.

## Conclusion

The traditional approach to the sound environment is meant to be a quantification of this sound mass, often categorized as a nuisance, source of discomfort for people. The new approach must be much more qualitative taking early into account the sound dimension with a view to improving the quality of life [4].

The work which we presented joins in a context where the sound phenomena in town became a real preoccupations for the projects of urban planning.

Currently, planners are based on standard acoustic measurements to assess the impact of a development.



The research we developed led us to no longer consider the regulation of urban noise pollution as a treatment in a negative note, but instead to help meet current developers' intentions on the quality of city life.

The sound dimension is essential to the city and must therefore be integrated into its development, not only to control the exposure of the population to noise, but also by enhancing the natural sound quality.

"Listening to a city or neighborhood is thus trying to grasp a mental representation that can provide policy makers and urban planners information that could help them to improve the quality of public spaces" [10].

## Perspectives

The conclusions of this paper intend to shed light on several avenues of research that may apply or continue the work started.

The results of this work suggest a prefiguration of the particular characteristics of the sound atmospheres in urban zones, and establishing an inventory of urban situations and devices, interesting the observation and the analysis of the urban sound atmospheres, multiple interdisciplinary deepening's of which are possible

## REFERENCES

- Bar P et Loye B, 1981: *Bruit et Formes Urbaines, Propagation du bruit routier dans les tissus urbains*, Centre d'Etude des Transports Urbains, CETUR.
- Bordeaux PLU, 2007: Bordeaux PLU, 2007: *local urbanism plan of the Greater Bordeaux community* July 2006.
- Decree 2005: Executive decree N°05.173 of 30 Rabie el Aouel 1426 corresponding to 09 mai 2005 regarding the creation and delimitation of the protected sector the « CASBAH of ALGIERS ». Alger. (decree 2003) : Executive decree N°03-324 of 09 chaabane 1424 corresponding to 5 octobre 2003 regarding the terms of the establishment of a permanent conservation and presentation plan for the protected sectors (PPSMVSS). Alger.
- Djellali D, Chadli M, Semidor C, 2007: *L'environnement sonore comme outil d'aide à la conception des ambiances*. Actes in Séminaire international « Ville et Santé». Constantine 2007. p 238-246.
- Kevin L, 1976 (1979): Kevin L, 1976 (1979) : *L'image de la cité*. Dunod ; coll. aspects de l'urbanisme. Paris.
- Léobon A, 1995 : "La qualification des ambiances sonores urbaines". Natures Sciences. Société 1995. P 26-41.
- Raimbault M, 2002 : *Simulation des ambiances sonores urbaines : intégration des aspects qualitatifs*. Thèse de doctorat .Nantes. Année 2002.
- Schafer R M, 1979: *Le paysage sonore*. Edition J-C Lattès. Paris.
- Semidor C, 2006: *Listening to a city with the soundwalk method*. Spécial Issue "Soundscape" Acta Acustica united with Acustica, vol. 92, 959-964.
- Semidor C, 2008 : *Mobilité et paysage sonore in Communauté Urbaine à Bordeaux Euratlantique, question durable de métropole, gouvernance et mémoires d'urbanité*. Bastingage, Collection Arts et société. Décembre 2008. p 141-146.
- 01dB Metravib Société de fabrication de logiciels et du matériel de mesures. France.
- Dahmane Djellali**, born 11 / 02 /1954 in Ain Bessam, Algeria. Algerian nationality, five children.  
Email: djellalidahmane@yahoo.fr  
Home Address: BP 36 EL MARSA 16711 Algiers.  
Business address: Polytechnic School of Architecture and Urbanism EPAU BP 177 16200 Alger El Harrach.  
Current Occupation: Teacher - Researcher. Assistant Master Class (A). Grade: Lecturer .EPAU.
- Diplomas: Architect of the state: June 1981. EPAU. Masters in Urban Planning: December 1996 EPAU.
- 1981 - 1988: Lecturer at the INFORBA (National Institute for Higher Education in building INFS). Engineering Education.
- 1988 - 1997: Head of Department at the INFS : SMSP/ Vocational Training and Implementation Status of Students 1997-2013: EPAU (Polytechnic School of Architecture and Urban Planning)
- Responsible and in charge of the 3rd Workshop Program Year 1Year Second Cycle (2012-2013). Construction and Atmospheres
- Accountable and responsible for the Workshop Programme 5thYear (2002-2009). Option: Architecture and Environment / Soundscapes and comfort.
- Mohammed Chadli**  
Age: 59 years, Nationality: Algerian  
E-mail: mdchadly@yahoo.co.uk  
Business address: Department of Geography and Regional Planning FSTGAT, USTHB Bab Ezzouar, 16111, Algiers
- Department of Geography and Regional Planning, University of Science and Technology Houari Boumediene since 1981
- State-PhD in Earth Sciences, option: Urban Development, December 2004. University of Science and Technology Houari Boumediene Algiers, Algeria

Magister-urbanism 1980-1984, USTHB-Graduate degree in geography, option: Regional Planning, 1979

Area of interest: Geography – Urban development, environmental protection, small and medium-sized cities, local development, habitat, geographic information system mapping, regionalization, campaigns, local authorities, risks.

Research activities

Head of the Master: cities and spatial dynamics since 2010

Responsible doctorat LMD city and regional planning  
Member of the Editorial Board of the journal "Geographical research" Tunis <http://aregtn-iffance.com> Reviewer for the journal Urban Environment / Urban Environment newspaper, Canada

<http://www.vrm.ca/cyber-reviews.asp>

President of the Scientific Committee of the National Symposium: Cities High Plains: Issues and Challenges, University of Djelfa, May 2009.

**Catherine Semidor**, born 11 October 1954 in Algiers (Algeria) French Nationality. two children.

Home Address : 19, chemin de l'Estey CESTAS.

Business address: 740 cours de la Libération - BP 70109 - 33405 Talence, cedex, France.

Professor EA at the National Superior School of Architecture and Landscape of Bordeaux.

Doctor of Physics, Empowered to Direct Research, Graduate School "Physical Sciences and Engineering", University of Bordeaux 1,

Scientific leader of GRECAU laboratory - ENSAPBx (Environment Research Group, Architecture and Urban Design, Bordeaux site)

Master of Mechanics and Engineering accredited jointly by the University of Bordeaux 1 and the National Superior Architecture and Landscape of Bordeaux School in association with the School of Architecture of Toulouse.

Award (best poster) PLEA 2003, Santiago, Chile

1999 Ph.D in Physical Sciences at the University Paul Sabatier Toulouse under the direction of C. Azaïs.

Teaching Activities

1981-1992 Teacher at the National Superior School of Architecture and Landscape of Bordeaux. 1992-2004 the Master Teacher "Scientific Fundamentals of Acoustics Architecture and Urban Design", University PARIS-VI Pierre and Marie Curie associated with the School of Architecture Paris Val de Seine (eg Defense).

2004 -2012 Quality of physical environments. Module: The architectural and urban space: interface between material world and physical world. Graduate School of Physical Engineering Sciences, University of Bordeaux1.